

First record and range extension of the freshwater limpet *Gundlachia radiata* (Guilding, 1828) (Mollusca: Gastropoda: Planorbidae) from southeast Brazil

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ABSTRACT: We report the first records of *Gundlachia radiata* (Guilding, 1828), a freshwater limpet, from the state of Rio de Janeiro, which extends its distribution to Southeast Brazil.

Gundlachia Pfeiffer, 1849, is one of the seven genera of the traditional Aculyidae (Hubendick 1967) that occur in the Neotropical region (Santos 2003), now included in the Aculyini tribe of Planorbidae (Bouchet & Rocroi 2005; Albrecht *et al.* 2007). This genus contains the greatest number of species among "Neotropical aculyids" (Lanzer 1996; Santos 2003; Ovando *et al.* 2011). The type locality of *Gundlachia radiata* (Guilding, 1828) is Saint Vincent, an island in the Caribbean Sea (Central America). The species is known for 24 countries in the Americas (Ovando *et al.* 2011). In Brazil, it is found in the North region to the states of Amazonas (Irmler 1975) and Pará (Lanzer 1996), in the Northern region to the state of Paraíba (Col. Mol. UERJ 54), Pernambuco (Lanzer 1996), Alagoas (Col. Mol. UERJ 25), and to the Central-Western region to the state of Goiás (Thiengo *et al.* 2005).

We report the first records of *Gundlachia radiata* (Figure 1) for the state of Rio de Janeiro (SRJ), and extend the species' geographic distribution to Southeast Brazil (Figure 2). We also present data on morphological variations in shell and soft-parts.

The material studied was collected from the municipalities of Rio de Janeiro and Nova Iguaçu in Rio de Janeiro state, Brazil (Figure 2). Fieldwork was conducted

under legal authorization (SISBIO 10812-1 and 23607-2). Species identification was done under stereomicroscope, and was based on shell shape and size, teleoconch and protoconch microsculpture, mantle pigmentation pattern and adductor muscle scars. Electron scanning microscopy images were also taken. Illustrations were done under *camera lucida*. Shell measurements and diagnostic characters were taken according Hubendick (1964), Lanzer (1996) and Santos (2003). Samples are housed in the Malacological Collection of the Universidade do Estado do Rio de Janeiro (Col. Mol. UERJ).

Examined material: Brazil, Rio de Janeiro: Rio de Janeiro (Santa Cruz, São Francisco channel, 22°51'43" S, 43°40'48" W), 10 animals (shells and soft parts), 13.VIII.2010, (Col. Mol. UERJ 8363). Nova Iguaçu (Guandu river, 22°48'22" S, 43°37'33" W), 49 animals (shells and soft parts), 26.IV.2011, (Col. Mol. UERJ 8379).

Although the collecting sites have different names (São Francisco Channel and Guandu River), both are in the same hydrographic catchment. Guandu River site is 11 km upriver from the São Francisco Channel site. The collection site in São Francisco channel has sandy bottoms and intense water flow. Both margins of the river have agricultural crops and sand is extracted commercially from the river. The second collecting site, in Guandu River (Nova Iguaçu), is at a dam adjacent to a water treatment plant with low water flow. In both sites, aculyids are found attached to *Eichornia* sp. (water hyacinth).

The 59 specimens show an elliptical shell opening (Figure 3A). The apex is rounded and right-posteriorly pointed; there is a shallow apical depression and up to two-thirds of the protoconch has irregular shallow pits (Figure 3). The anterior right adductor muscle scar is more elliptical than the left, with a slight curvature in the inner portion (Figure 4). All of these characters fit well with descriptions of *Gundlachia radiata* (Hubendick 1967; Lanzer 1996; Santos 2003). All specimens from Santa Cruz, Municipality of Rio de Janeiro, have dark pigmentation concentrated on the anterior region of the mantle roof whereas the specimens from Municipality of Nova Iguaçu



FIGURE 1. Dorsal view of *Gundlachia radiata* from the municipality of Nova Iguaçu, state of Rio de Janeiro, Brazil. Scale = 1mm. Photo by L.E.M. Lacerda.

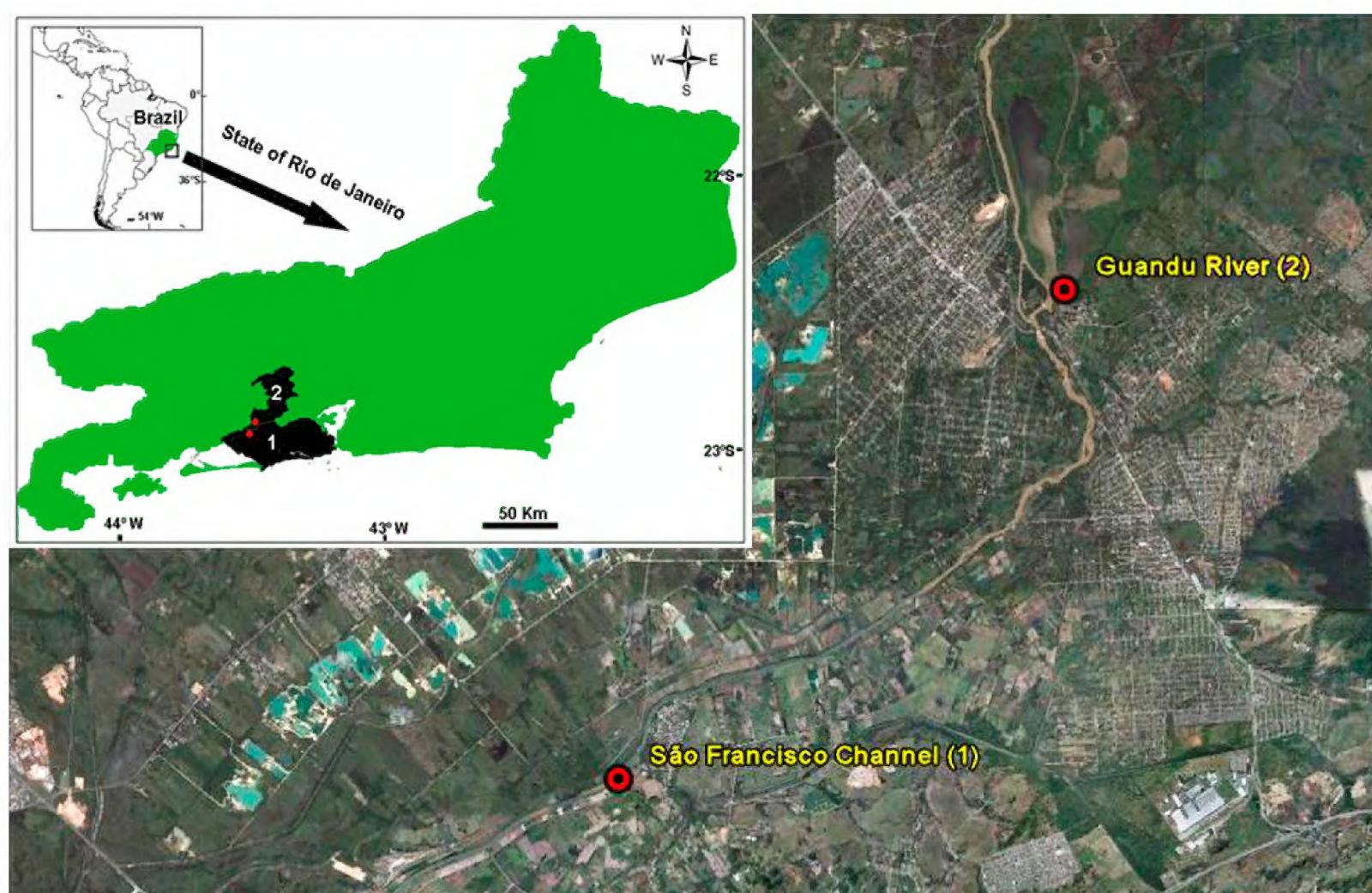


FIGURE 2. Map showing the localities in Rio de Janeiro state where *Gundlachia radiata* has been recorded. (1) Municipality of Rio de Janeiro (São Francisco Channel) and (2) municipality of Nova Iguaçu (Guandu River). Satellite image from Google Earth.

show three pigmentation patterns: 1) moderate, dark blotches on the mantle edge (55% of specimens); 2) weak, two blotches, anterior and posterior (29% of specimens); and 3) heavy, pigmentation of all of the mantle roof (16% of specimens) (Figure 4A-D). The variation in pigmentation patterns is not a good systematic character, although absence of pigmentation could be diagnostic for other genera such as *Ferrissia* Walker, 1903 and *Burnupia* Walker, 1912 (Lanzer 1996; Santos 2003).

The average measurements (mm) and standard deviation from 49 shells of *G. radiata* collected in the Municipality of Rio de Janeiro and their ranges (maximum-minimum) were 6.10 ± 1.81 (9.72-2.82) length, 3.65 ± 1.05 (5.93-1.93) width and 1.32 ± 0.40 (2.06-0.49) height; and in the Municipality of Nova Iguaçu, 4.32 ± 1.24 (6.15-2.25) length, 2.85 ± 1.00 (4.50-1.40) width and 1.16 ± 0.37 (1.80-0.60) height. Considering all specimens together, they

were 5.78 ± 1.84 (9.72-2.25) length, 3.51 ± 1.07 (5.93-1.40) width and 1.29 ± 0.39 (2.06-0.49) height.

A septum closing the aperture of the shell is commonly found in some aptylid populations, when submitted to adverse environmental conditions, preventing water loss (Aguayo 1946; Hylton-Scott 1954; Richardot 1974; Santos 2003). Such shells are said to be gundlachioid, as the genus *Gundlachia* was described based on this character (Guilding, 1828). We did not find any gundlachioid shells in the studied material although this kind of shell is common in *Gundlachia radiata* populations (Hubendick 1967; Santos 2003; Ovando et al. 2011). This situation was found by Ovando et al. (2011) in temporary ponds of Argentina, where almost 50% of specimens were gundlachioid, indicating a stressful environment for *G. radiata*; recently a septum formation was also described to *Gundlachia ticaga* Marcus & Marcus, 1962 to the state of

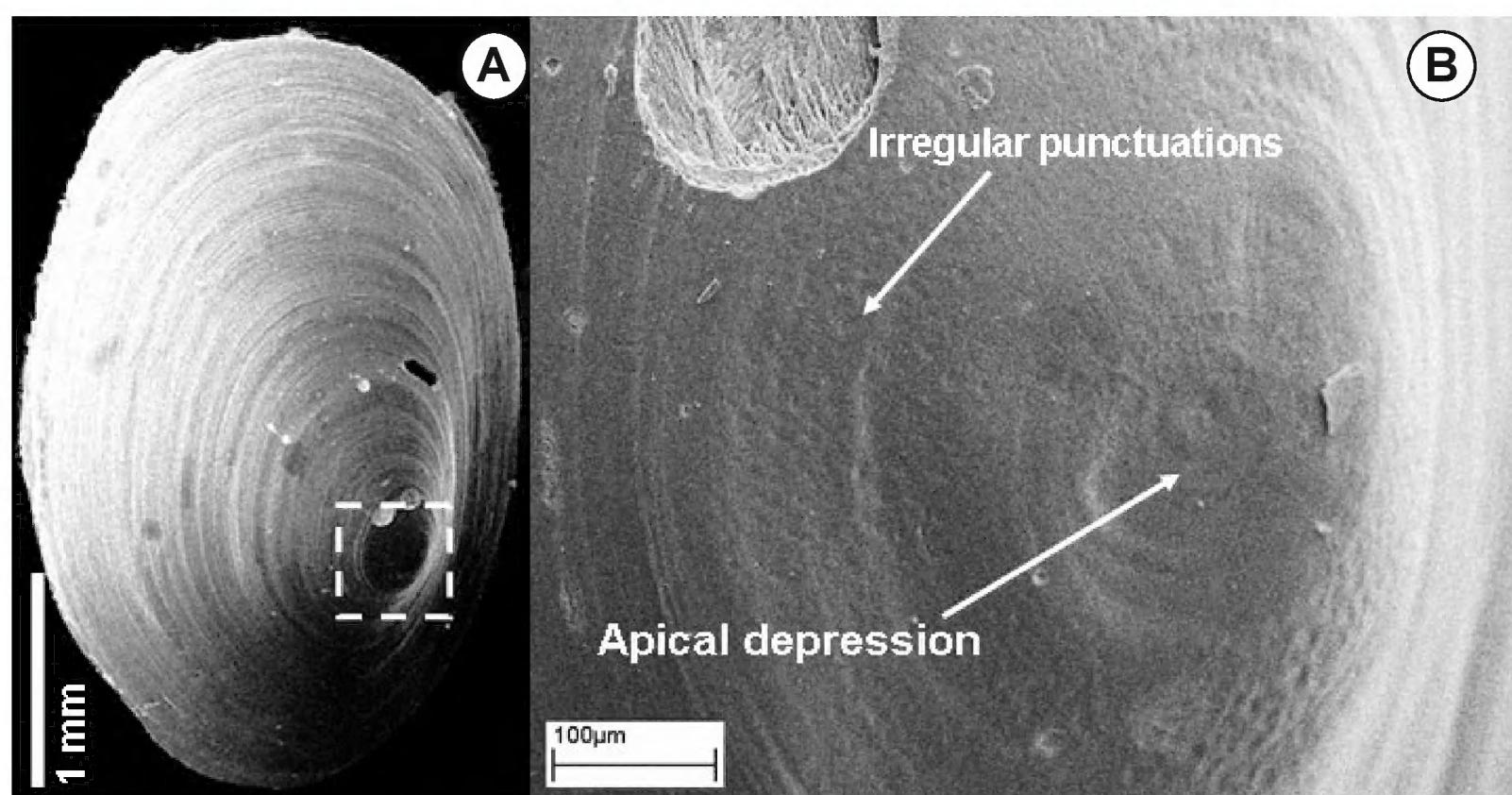


FIGURE 3. *Gundlachia radiata* shell. (A) Dorsal view, showing absence of radial lines on the teleoconch. Square: protoconch area. (B) Detail of the protoconch showing the irregularly arranged pits and apical depression. Photo by A. Moraes.

São Paulo, Brazil (Simone et al. 2012).

The present record of *Gundlachia radiata* from Rio de Janeiro and Nova Iguaçu represents the first record of the species for the state of Rio de Janeiro and a range extension to Southeast Brazil. Two hypotheses could explain this new record: it is a recent introduction, because previous surveys in the studied area (Thiengo et al. 2001) were

not able to find the species or, its real occurrence area has been underestimated because surveys in the state of Rio de Janeiro have focused primarily on schistosomiasis vectors (Thiengo et al. 2002a; b; 2004a; b; 2006). The present record increases one additional species to the list of ancylids of Rio de Janeiro state, which now reaches seven known species.

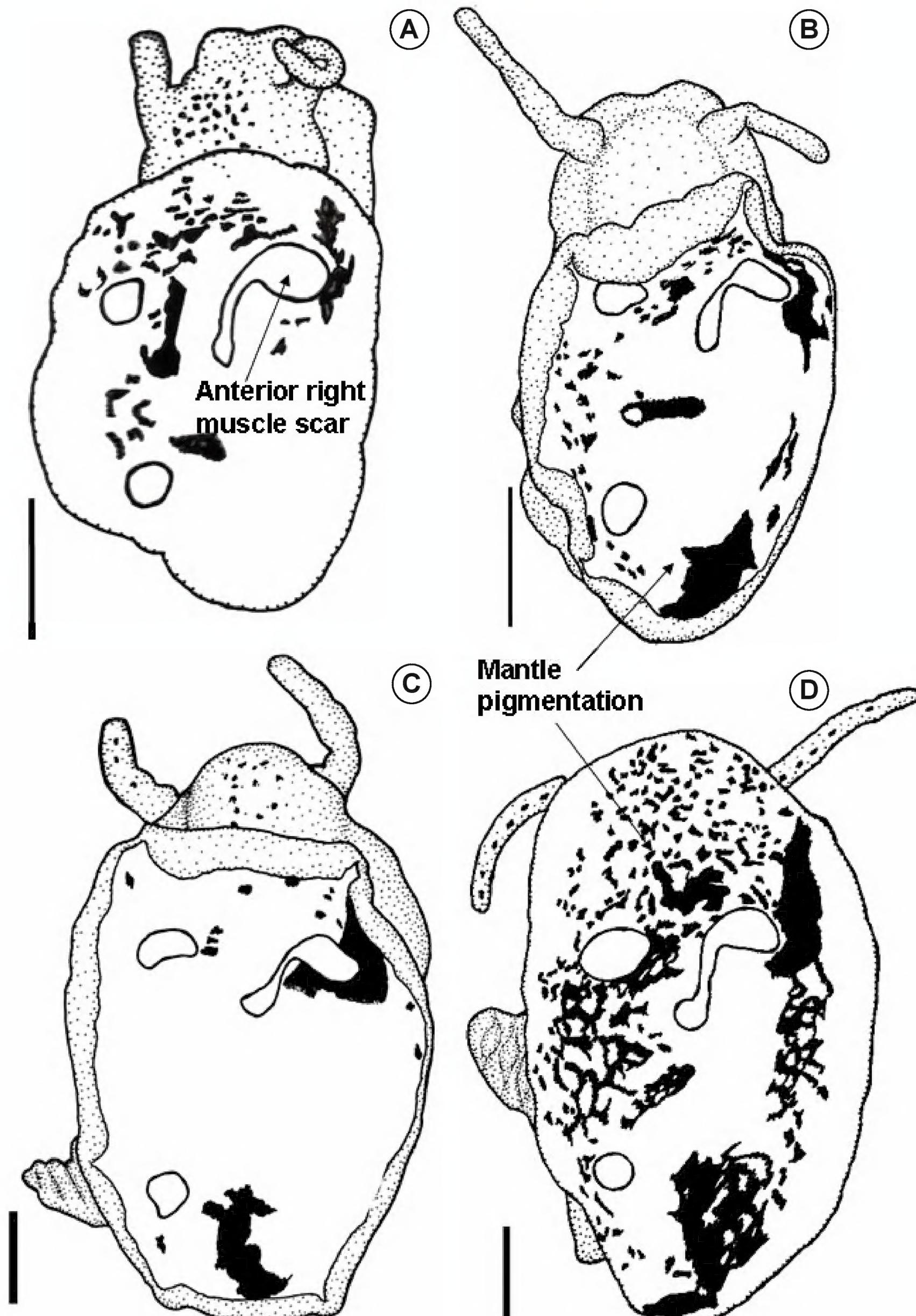


FIGURE 4. *Gundlachia radiata* from the state of Rio de Janeiro: variation on mantle pattern pigmentation (A) Specimens from Santa Cruz, Rio de Janeiro Municipality. (B-D) Specimens from Nova Iguaçu Municipality; (B) Moderate; (C) Weak and (D) Heavy. Scale = 1mm. Drawings by L.E.M. Lacerda.

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